



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 1K Microwire Compatible Serial EEPROM

Device Selection Table

| Part Number | Vcc Range | ORG Pin | Word Size   | Temp Ranges | Packages          |
|-------------|-----------|---------|-------------|-------------|-------------------|
| 93AA46A     | 1.8-5.5   | No      | 8-bit       | I           | P, SN, ST, MS, OT |
| 93AA46B     | 1.8-5.5   | No      | 16-bit      | I           | P, SN, ST, MS, OT |
| 93LC46A     | 2.5-5.5   | No      | 8-bit       | I, E        | P, SN, ST, MS, OT |
| 93LC46B     | 2.5-5.5   | No      | 16-bit      | I, E        | P, SN, ST, MS, OT |
| 93C46A      | 4.5-5.5   | No      | 8-bit       | I, E        | P, SN, ST, MS, OT |
| 93C46B      | 4.5-5.5   | No      | 16-bit      | I, E        | P, SN, ST, MS, OT |
| 93AA46C     | 1.8-5.5   | Yes     | 8 or 16-bit | I           | P, SN, ST, MS     |
| 93LC46C     | 2.5-5.5   | Yes     | 8 or 16-bit | I, E        | P, SN, ST, MS     |
| 93C46C      | 4.5-5.5   | Yes     | 8 or 16-bit | I, E        | P, SN, ST, MS     |

### Features

- Low-power CMOS technology
- ORG pin to select word size for '46C version
- 128 x 8-bit organization 'A' ver. devices (no ORG)
- 64 x 16-bit organization 'B' ver. devices (no ORG)
- Self-timed ERASE/WRITE cycles (including auto-erase)
- Automatic ERL before WRAL
- Power-on/off data protection circuitry
- Industry standard 3-wire serial I/O
- Device Status signal (READY/BUSY)
- Sequential READ function
- 1,000,000 E/W cycles
- Data retention > 200 years
- Temperature ranges supported
  - Industrial (I) -40°C to +85°C
  - Automotive (E) -40°C to +125°C

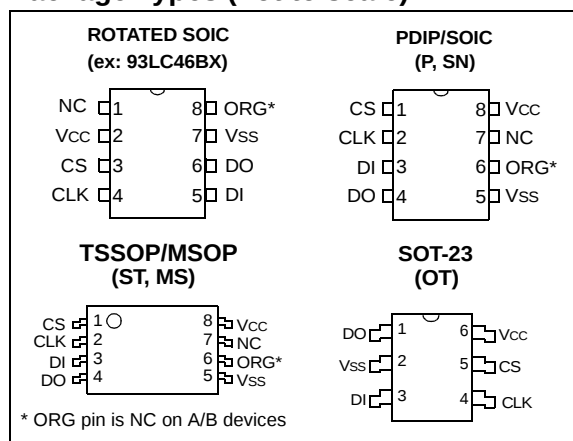
Pin Function Table

| Name | Function               |
|------|------------------------|
| CS   | Chip Select            |
| CLK  | Serial Data Clock      |
| DI   | Serial Data Input      |
| DO   | Serial Data Output     |
| Vss  | Ground                 |
| NC   | No internal connection |
| ORG  | Memory Configuration   |
| Vcc  | Power Supply           |

### Description

The Microchip Technology Inc. 93XX46A/B/C devices are 1K bit low voltage serial Electrically Erasable PROMs (EEPROM). Word-selectable devices such as the 93AA46C, 93LC46C or 93C46C are dependent upon external logic levels driving the ORG pin to set word size. For dedicated 8-bit communication, the 93AA46A, 93LC46A or 93C46A devices are available, while the 93AA46B, 93LC46B and 93C46B devices provide dedicated 16-bit communication. Advanced CMOS technology makes these devices ideal for low power, nonvolatile memory applications. The entire 93XX Series is available in standard packages including 8-lead PDIP and SOIC, and advanced packaging including 8-lead MSOP, 6-lead SOT-23, and 8-lead TSSOP. Pb-free (Pure Matte Sn) finish is also available.

Package Types (not to scale)



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings<sup>(†)</sup>

|                                                     |                                |
|-----------------------------------------------------|--------------------------------|
| V <sub>CC</sub> .....                               | 7.0V                           |
| All inputs and outputs w.r.t. V <sub>SS</sub> ..... | -0.6V to V <sub>CC</sub> +1.0V |
| Storage temperature .....                           | -65°C to +150°C                |
| Ambient temperature with power applied .....        | -40°C to +125°C                |
| ESD protection on all pins .....                    | ≥ 4 kV                         |

† **NOTICE:** Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

**TABLE 1-1: DC CHARACTERISTICS**

| All parameters apply over the specified ranges unless otherwise noted. |                                       |                                                                          | V <sub>CC</sub> = range by device (see Table on Page 1)<br>Industrial (I): TA = -40°C to +85°C<br>Automotive (E): TA = -40°C to +125°C |      |                     |       |                                                                                                                 |
|------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------|---------------------|-------|-----------------------------------------------------------------------------------------------------------------|
| Param. No.                                                             | Symbol                                | Parameter                                                                | Min                                                                                                                                    | Typ  | Max                 | Units | Conditions                                                                                                      |
| D1                                                                     | V <sub>IH1</sub>                      | High-level input voltage                                                 | 2.0                                                                                                                                    | —    | V <sub>CC</sub> +1  | V     | V <sub>CC</sub> ≥ 2.7V                                                                                          |
|                                                                        | V <sub>IH2</sub>                      |                                                                          | 0.7 V <sub>CC</sub>                                                                                                                    | —    | V <sub>CC</sub> +1  | V     | V <sub>CC</sub> < 2.7V                                                                                          |
| D2                                                                     | V <sub>IL1</sub>                      | Low-level input voltage                                                  | -0.3                                                                                                                                   | —    | 0.8                 | V     | V <sub>CC</sub> ≥ 2.7V                                                                                          |
|                                                                        | V <sub>IL2</sub>                      |                                                                          | -0.3                                                                                                                                   | —    | 0.2 V <sub>CC</sub> | V     | V <sub>CC</sub> < 2.7V                                                                                          |
| D3                                                                     | V <sub>OL1</sub>                      | Low-level output voltage                                                 | —                                                                                                                                      | —    | 0.4                 | V     | I <sub>OL</sub> = 2.1 mA, V <sub>CC</sub> = 4.5V                                                                |
|                                                                        | V <sub>OL2</sub>                      |                                                                          | —                                                                                                                                      | —    | 0.2                 | V     | I <sub>OL</sub> = 100 μA, V <sub>CC</sub> = 2.5V                                                                |
| D4                                                                     | V <sub>OH1</sub>                      | High-level output voltage                                                | 2.4                                                                                                                                    | —    | —                   | V     | I <sub>OH</sub> = -400 μA, V <sub>CC</sub> = 4.5V                                                               |
|                                                                        | V <sub>OH2</sub>                      |                                                                          | V <sub>CC</sub> - 0.2                                                                                                                  | —    | —                   | V     | I <sub>OH</sub> = -100 μA, V <sub>CC</sub> = 2.5V                                                               |
| D5                                                                     | I <sub>LI</sub>                       | Input leakage current                                                    | —                                                                                                                                      | —    | ±1                  | μA    | V <sub>IN</sub> = V <sub>SS</sub> to V <sub>CC</sub>                                                            |
| D6                                                                     | I <sub>LO</sub>                       | Output leakage current                                                   | —                                                                                                                                      | —    | ±1                  | μA    | V <sub>OUT</sub> = V <sub>SS</sub> to V <sub>CC</sub>                                                           |
| D7                                                                     | C <sub>IN</sub> ,<br>C <sub>OUT</sub> | Pin capacitance<br>(all inputs/outputs)                                  | —                                                                                                                                      | —    | 7                   | pF    | V <sub>IN</sub> /V <sub>OUT</sub> = 0V ( <b>Note 1</b> )<br>TA = 25°C, F <sub>CLK</sub> = 1 MHz                 |
| D8                                                                     | I <sub>CC</sub> write                 | Write current                                                            | —                                                                                                                                      | —    | 2                   | mA    | F <sub>CLK</sub> = 3 MHz, V <sub>CC</sub> = 5.5V                                                                |
|                                                                        |                                       |                                                                          | —                                                                                                                                      | 500  | —                   | μA    | F <sub>CLK</sub> = 2 MHz, V <sub>CC</sub> = 2.5V                                                                |
| D9                                                                     | I <sub>CC</sub> read                  | Read current                                                             | —                                                                                                                                      | —    | 1                   | mA    | F <sub>CLK</sub> = 3 MHz, V <sub>CC</sub> = 5.5V                                                                |
|                                                                        |                                       |                                                                          | —                                                                                                                                      | —    | 500                 | μA    | F <sub>CLK</sub> = 2 MHz, V <sub>CC</sub> = 3.0V                                                                |
|                                                                        |                                       |                                                                          | —                                                                                                                                      | 100  | —                   | μA    | F <sub>CLK</sub> = 2 MHz, V <sub>CC</sub> = 2.5V                                                                |
| D10                                                                    | I <sub>CCS</sub>                      | Standby current                                                          | —                                                                                                                                      | —    | 1                   | μA    | I-Temp                                                                                                          |
|                                                                        |                                       |                                                                          | —                                                                                                                                      | —    | 5                   | μA    | E-Temp<br>CLK = CS = 0V<br>ORG = DI = V <sub>SS</sub> or V <sub>CC</sub><br>( <b>Note 2</b> ) ( <b>NOTE 3</b> ) |
| D11                                                                    | V <sub>POR</sub>                      | V <sub>CC</sub> voltage detect<br>93AA46A/B/C, 93LC46A/B/C<br>93C46A/B/C | —                                                                                                                                      | 1.5V | —                   | V     | (Note 1)                                                                                                        |
|                                                                        |                                       |                                                                          | —                                                                                                                                      | 3.8V | —                   | V     |                                                                                                                 |

**Note 1:** This parameter is periodically sampled and not 100% tested.

**2:** ORG pin not available on 'A' or 'B' versions.

**3:** READY/BUSY status must be cleared from DO, see **Section 3.4 "Data Out (DO)"**.

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

**TABLE 1-2: AC CHARACTERISTICS**

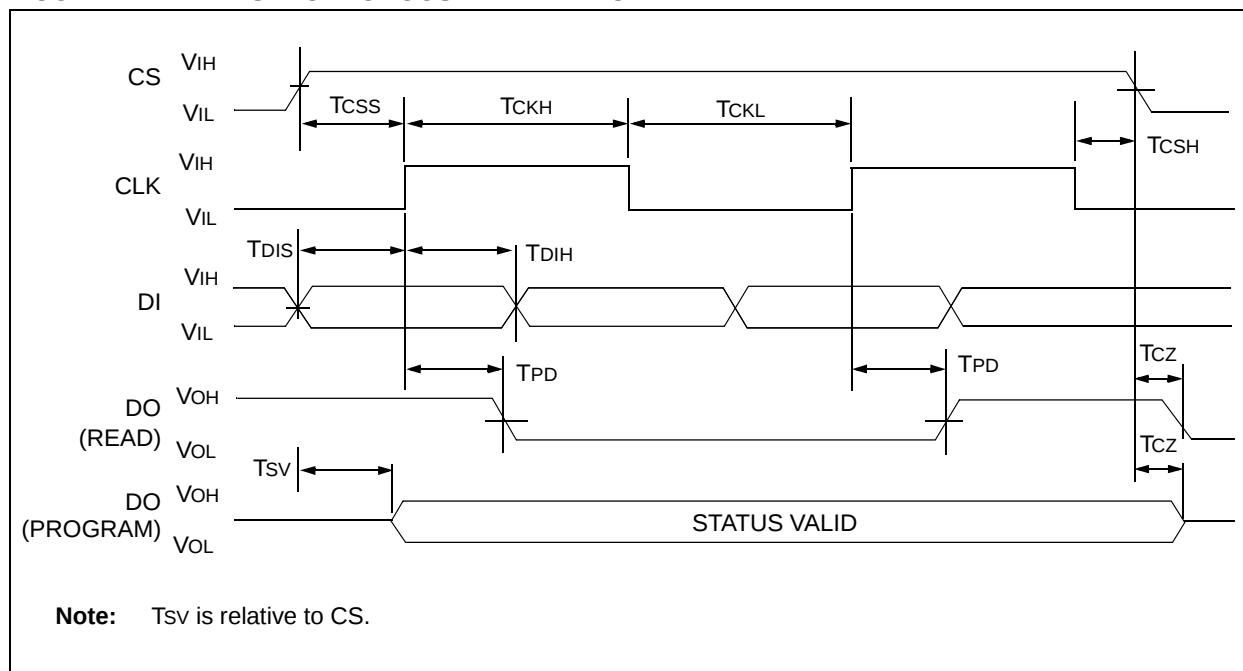
| All parameters apply over the specified ranges unless otherwise noted. |        |                          | Vcc = range by device (see Table on Page 1)<br>Industrial (I): TA = -40°C to +85°C<br>Automotive (E): TA = -40°C to +125°C |                   |                   |                                                                                                    |
|------------------------------------------------------------------------|--------|--------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|----------------------------------------------------------------------------------------------------|
| Param. No.                                                             | Symbol | Parameter                | Min                                                                                                                        | Max               | Units             | Conditions                                                                                         |
| A1                                                                     | FCLK   | Clock frequency          | —                                                                                                                          | 3<br>2<br>1       | MHz<br>MHz<br>MHz | 4.5V ≤ Vcc < 5.5V, 93XX46C only<br>2.5V ≤ Vcc < 5.5V<br>1.8V ≤ Vcc < 2.5V                          |
| A2                                                                     | TCKH   | Clock high time          | 200<br>250<br>450                                                                                                          | —                 | ns<br>ns<br>ns    | 4.5V ≤ Vcc < 5.5V, 93XX46C only<br>2.5V ≤ Vcc < 5.5V<br>1.8V ≤ Vcc < 2.5V                          |
| A3                                                                     | TCKL   | Clock low time           | 100<br>200<br>450                                                                                                          | —                 | ns<br>ns<br>ns    | 4.5V ≤ Vcc < 5.5V, 93XX46C only<br>2.5V ≤ Vcc < 5.5V<br>1.8V ≤ Vcc < 2.5V                          |
| A4                                                                     | Tcss   | Chip Select setup time   | 50<br>100<br>250                                                                                                           | —                 | ns<br>ns<br>ns    | 4.5V ≤ Vcc < 5.5V<br>2.5V ≤ Vcc < 4.5V<br>1.8V ≤ Vcc < 2.5V                                        |
| A5                                                                     | TCSH   | Chip Select hold time    | 0                                                                                                                          | —                 | ns                | 1.8V ≤ Vcc < 5.5V                                                                                  |
| A6                                                                     | TCSL   | Chip Select low time     | 250                                                                                                                        | —                 | ns                | 1.8V ≤ Vcc < 5.5V                                                                                  |
| A7                                                                     | TDIS   | Data input setup time    | 50<br>100<br>250                                                                                                           | —                 | ns                | 4.5V ≤ Vcc < 5.5V, 93XX46C only<br>2.5V ≤ Vcc < 5.5V<br>1.8V ≤ Vcc < 2.5V                          |
| A8                                                                     | TDIH   | Data input hold time     | 50<br>100<br>250                                                                                                           | —                 | ns                | 4.5V ≤ Vcc < 5.5V, 93XX46C only<br>2.5V ≤ Vcc < 5.5V<br>1.8V ≤ Vcc < 2.5V                          |
| A9                                                                     | TPD    | Data output delay time   | —<br>—<br>—                                                                                                                | 200<br>250<br>400 | ns                | 4.5V ≤ Vcc < 5.5V, CL = 100 pF<br>2.5V ≤ Vcc < 4.5V, CL = 100 pF<br>1.8V ≤ Vcc < 2.5V, CL = 100 pF |
| A10                                                                    | Tcz    | Data output disable time | —<br>—                                                                                                                     | 100<br>200        | ns                | 4.5V ≤ Vcc < 5.5V, <b>(Note 1)</b><br>1.8V ≤ Vcc < 4.5V, <b>(Note 1)</b>                           |
| A11                                                                    | Tsv    | Status valid time        | —                                                                                                                          | 200<br>300<br>500 | ns                | 4.5V ≤ Vcc < 5.5V, CL = 100 pF<br>2.5V ≤ Vcc < 4.5V, CL = 100 pF<br>1.8V ≤ Vcc < 2.5V, CL = 100 pF |
| A12                                                                    | Twc    | Program cycle time       | —                                                                                                                          | 6                 | ms                | Erase/Write mode (AA and LC versions)                                                              |
| A13                                                                    | Twc    |                          | —                                                                                                                          | 2                 | ms                | Erase/Write mode (93C versions)                                                                    |
| A14                                                                    | TEC    |                          | —                                                                                                                          | 6                 | ms                | ERAL mode, 4.5V ≤ Vcc ≤ 5.5V                                                                       |
| A15                                                                    | TWL    |                          | —                                                                                                                          | 15                | ms                | WRAL mode, 4.5V ≤ Vcc ≤ 5.5V                                                                       |
| A16                                                                    | —      | Endurance                | 1M                                                                                                                         | —                 | cycles            | 25°C, Vcc = 5.0V, <b>(Note 2)</b>                                                                  |

**Note 1:** This parameter is periodically sampled and not 100% tested.

**2:** This application is not tested but ensured by characterization. For endurance estimates in a specific application, please consult the Total Endurance™ Model which may be obtained from [www.microchip.com](http://www.microchip.com).

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

**FIGURE 1-1: SYNCHRONOUS DATA TIMING**



**TABLE 1-3: INSTRUCTION SET FOR X 16 ORGANIZATION (93XX46B OR 93XX46C WITH ORG = 1)**

| Instruction | SB | Opcode | Address           | Data In  | Data Out  | Req. CLK Cycles |
|-------------|----|--------|-------------------|----------|-----------|-----------------|
| ERASE       | 1  | 11     | A5 A4 A3 A2 A1 A0 | —        | (RDY/BSY) | 9               |
| ERAL        | 1  | 00     | 1 0 X X X X       | —        | (RDY/BSY) | 9               |
| EWDS        | 1  | 00     | 0 0 X X X X       | —        | HIGH-Z    | 9               |
| EWEN        | 1  | 00     | 1 1 X X X X       | —        | HIGH-Z    | 9               |
| READ        | 1  | 10     | A5 A4 A3 A2 A1 A0 | —        | D15 - D0  | 25              |
| WRITE       | 1  | 01     | A5 A4 A3 A2 A1 A0 | D15 - D0 | (RDY/BSY) | 25              |
| WRAL        | 1  | 00     | 0 1 X X X X       | D15 - D0 | (RDY/BSY) | 25              |

**TABLE 1-4: INSTRUCTION SET FOR X 8 ORGANIZATION (93XX46A OR 93XX46C WITH ORG = 0)**

| Instruction | SB | Opcode | Address              | Data In | Data Out  | Req. CLK Cycles |
|-------------|----|--------|----------------------|---------|-----------|-----------------|
| ERASE       | 1  | 11     | A6 A5 A4 A3 A2 A1 A0 | —       | (RDY/BSY) | 10              |
| ERAL        | 1  | 00     | 1 0 X X X X X        | —       | (RDY/BSY) | 10              |
| EWDS        | 1  | 00     | 0 0 X X X X X        | —       | HIGH-Z    | 10              |
| EWEN        | 1  | 00     | 1 1 X X X X X        | —       | HIGH-Z    | 10              |
| READ        | 1  | 10     | A6 A5 A4 A3 A2 A1 A0 | —       | D7 - D0   | 18              |
| WRITE       | 1  | 01     | A6 A5 A4 A3 A2 A1 A0 | D7 - D0 | (RDY/BSY) | 18              |
| WRAL        | 1  | 00     | 0 1 X X X X X        | D7 - D0 | (RDY/BSY) | 18              |

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 2.0 FUNCTIONAL DESCRIPTION

When the ORG\* pin is connected to VCC, the (x16) organization is selected. When it is connected to ground, the (x8) organization is selected. Instructions, addresses and write data are clocked into the DI pin on the rising edge of the clock (CLK). The DO pin is normally held in a HIGH-Z state except when reading data from the device, or when checking the READY/BUSY status during a programming operation. The READY/BUSY status can be verified during an Erase/Write operation by polling the DO pin; DO low indicates that programming is still in progress, while DO high indicates the device is ready. DO will enter the HIGH-Z state on the falling edge of CS.

### 2.1 Start Condition

The Start bit is detected by the device if CS and DI are both high with respect to the positive edge of CLK for the first time.

Before a Start condition is detected, CS, CLK, and DI may change in any combination (except to that of a Start condition), without resulting in any device operation (READ, WRITE, ERASE, EWEN, EWDS, ERAL, or WRAL). As soon as CS is high, the device is no longer in Standby mode.

An instruction following a Start condition will only be executed if the required opcode, address and data bits for any particular instruction are clocked in.

### 2.2 Data In/Data Out (DI/DO)

It is possible to connect the Data In and Data Out pins together. However, with this configuration it is possible for a "bus conflict" to occur during the "dummy zero" that precedes the READ operation, if A0 is a logic high level. Under such a condition the voltage level seen at Data Out is undefined and will depend upon the relative impedances of Data Out and the signal source driving A0. The higher the current sourcing capability of A0, the higher the voltage at the Data Out pin. In order to limit this current, a resistor should be connected between DI and DO.

## 2.3 Data Protection

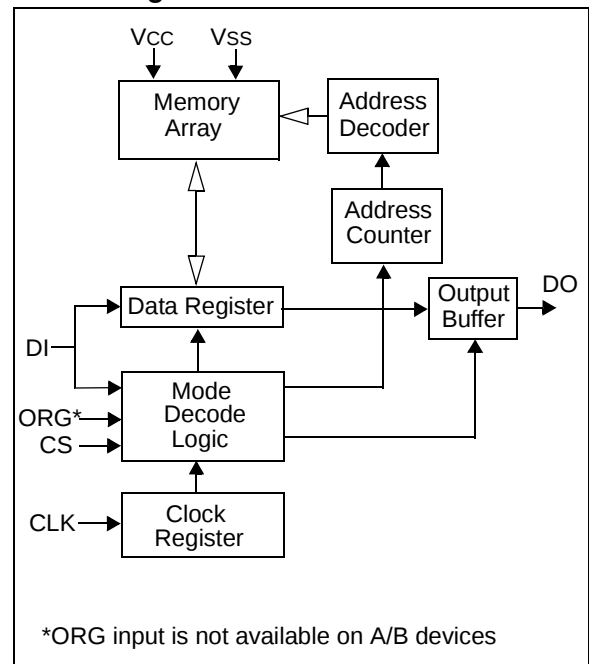
All modes of operation are inhibited when VCC is below a typical voltage of 1.5V for '93AA' and '93LC' devices or 3.8V for '93C' devices.

The EWEN and EWDS commands give additional protection against accidentally programming during normal operation.

**Note:** For added protection, an EWDS command should be performed after every write operation.

After power-up, the device is automatically in the EWDS mode. Therefore, an EWEN instruction must be performed before the initial ERASE or WRITE instruction can be executed.

### Block Diagram



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

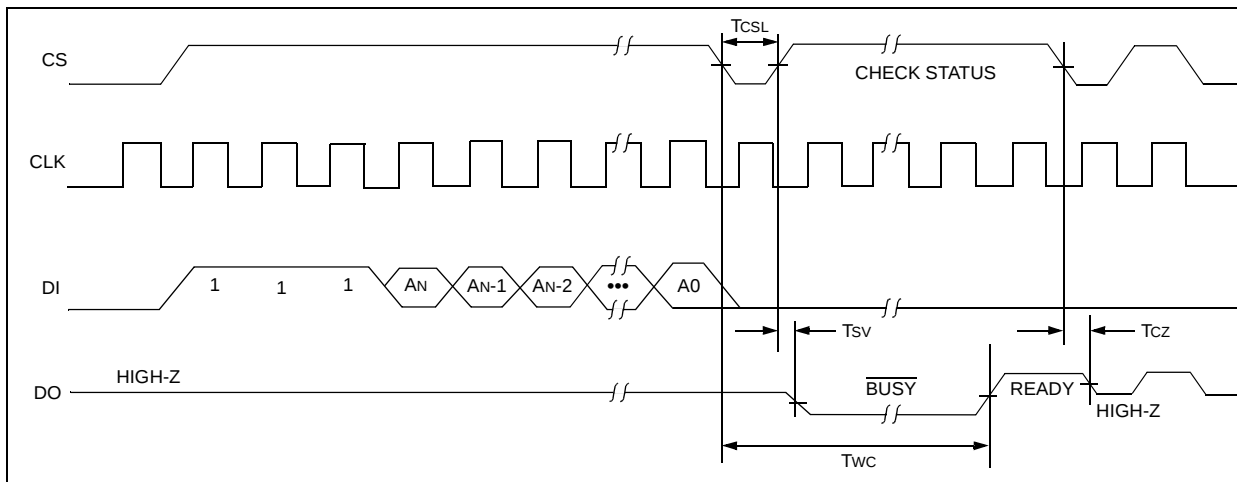
## 2.4 ERASE

The ERASE instruction forces all data bits of the specified address to the logical '1' state. CS is brought low following the loading of the last address bit. This falling edge of the CS pin initiates the self-timed programming cycle, except on '93C' devices where the rising edge of CLK before the last address bit initiates the write cycle.

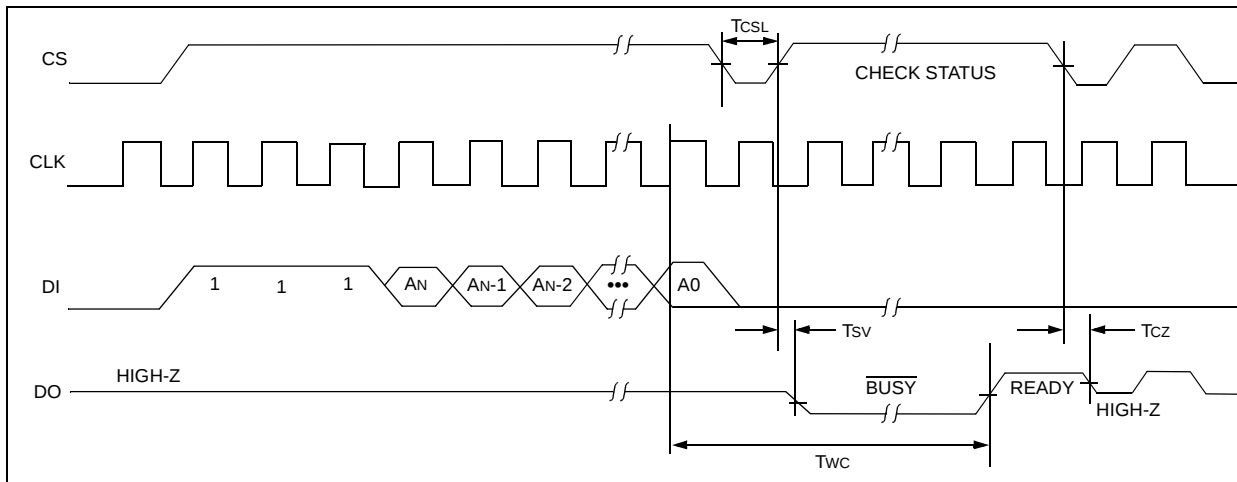
The DO pin indicates the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status of the device if CS is brought high after a minimum of 250 ns low ( $T_{\text{CSL}}$ ). DO at logical '0' indicates that programming is still in progress. DO at logical '1' indicates that the register at the specified address has been erased and the device is ready for another instruction.

**Note:** Issuing a Start bit and then taking CS low will clear the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status from DO.

**FIGURE 2-1: ERASE TIMING FOR 93AA AND 93LC DEVICES**



**FIGURE 2-2: ERASE TIMING FOR 93C DEVICES**



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 2.5 ERASE ALL (ERAL)

The Erase All (ERAL) instruction will erase the entire memory array to the logical '1' state. The ERAL cycle is identical to the ERASE cycle, except for the different opcode. The ERAL cycle is completely self-timed and commences at the falling edge of the CS, except on '93C' devices where the rising edge of CLK before the last data bit initiates the write cycle. Clocking of the CLK pin is not necessary after the device has entered the ERAL cycle.

The DO pin indicates the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status of the device, if CS is brought high after a minimum of 250 ns low ( $T_{\text{CSL}}$ ).

**Note:** Issuing a Start bit and then taking CS low will clear the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status from DO.

VCC must be  $\geq 4.5\text{V}$  for proper operation of ERAL.

FIGURE 2-3: ERAL TIMING FOR 93AA AND 93LC DEVICES

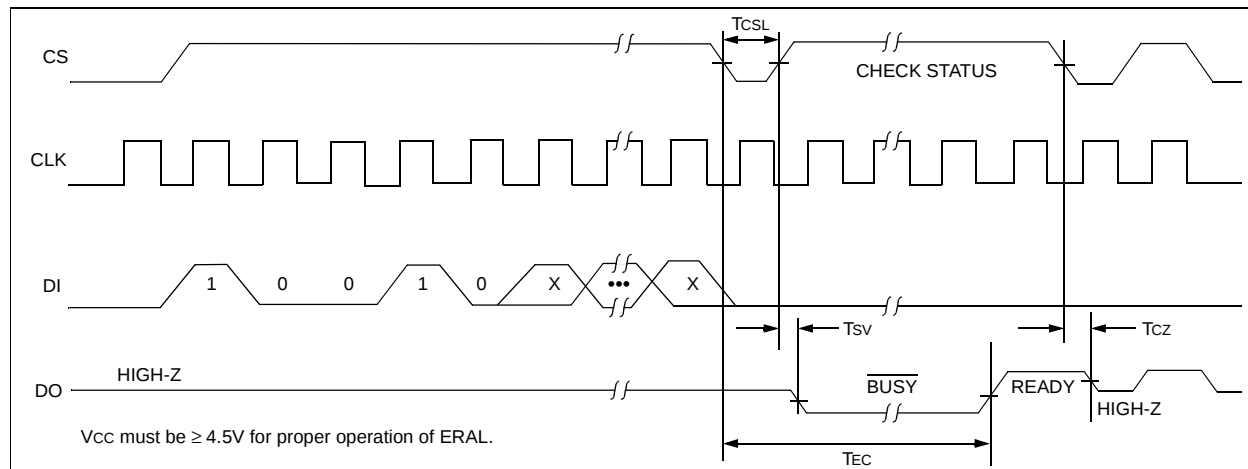
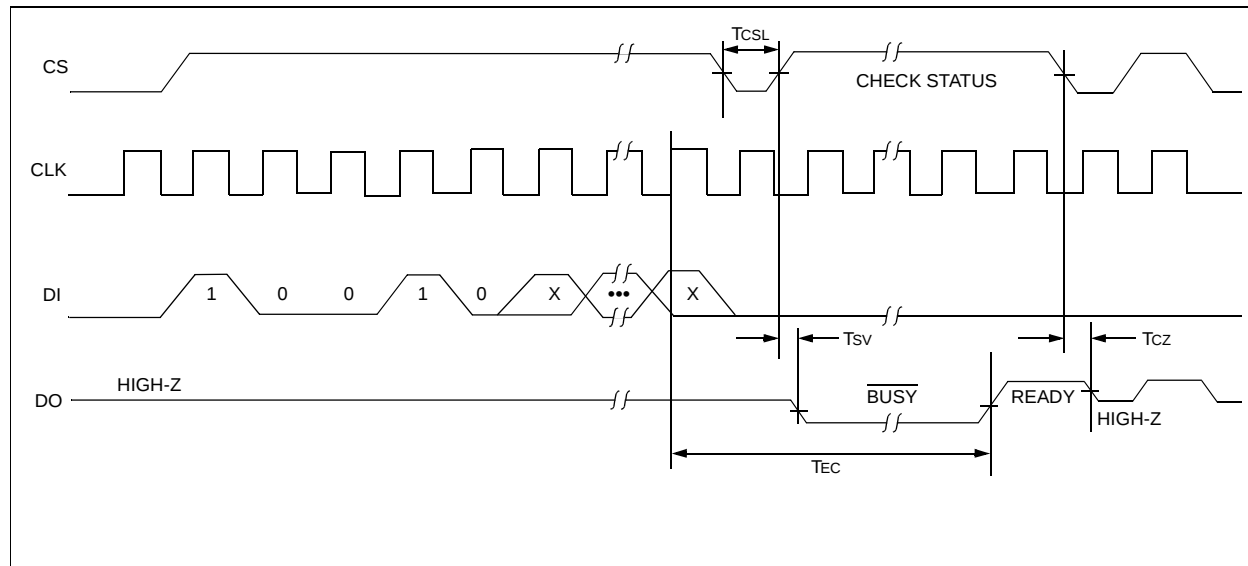


FIGURE 2-4: ERAL TIMING FOR 93C DEVICES



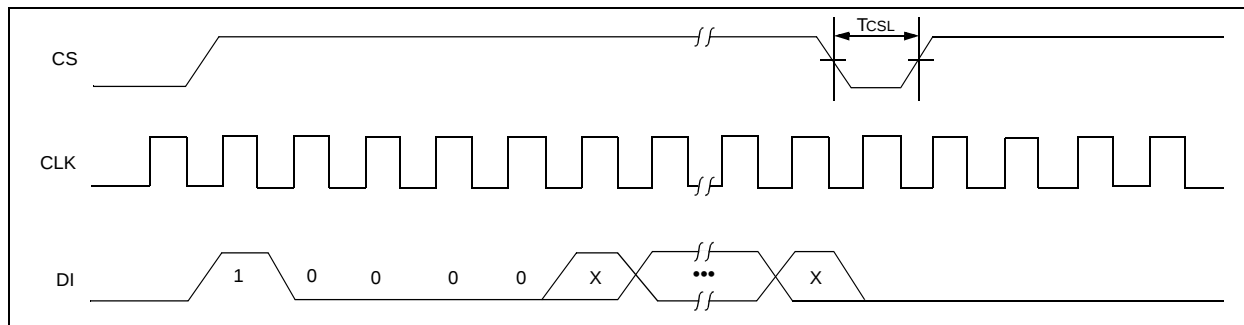
# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 2.6 ERASE/WRITE DISABLE And ENABLE (EWDS/EWEN)

The 93XX46A/B/C powers up in the ERASE/WRITE Disable (EWDS) state. All Programming modes must be preceded by an ERASE/WRITE Enable (EWEN) instruction. Once the EWEN instruction is executed, programming remains enabled until an EWDS instruction is executed or Vcc is removed from the device.

To protect against accidental data disturbance, the EWDS instruction can be used to disable all ERASE/WRITE functions and should follow all programming operations. Execution of a READ instruction is independent of both the EWEN and EWDS instructions.

**FIGURE 2-5: EWDS TIMING**



**FIGURE 2-6: EWEN TIMING**

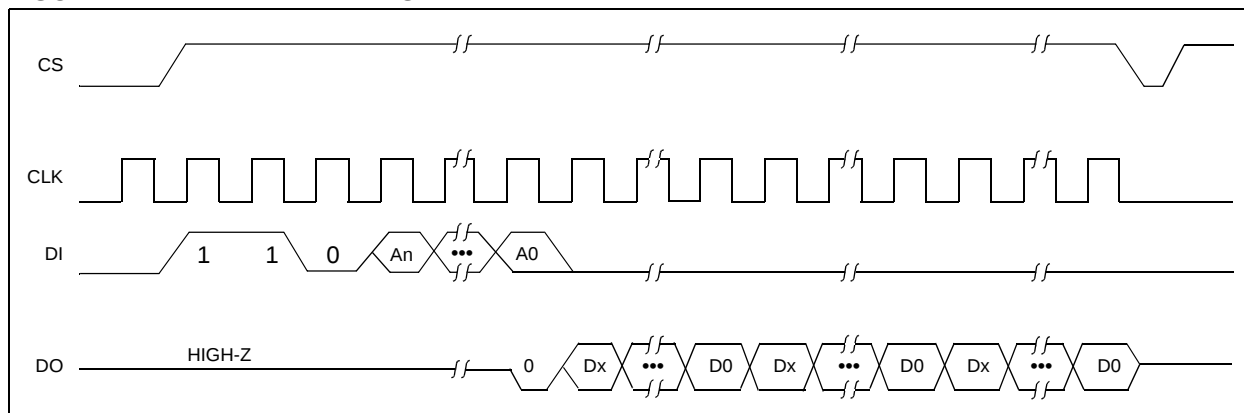


## 2.7 READ

The READ instruction outputs the serial data of the addressed memory location on the DO pin. A dummy zero bit precedes the 8-bit (If ORG pin is low or A-Version devices) or 16-bit (If ORG pin is high or B-version devices) output string. The output data bits will toggle on

the rising edge of the CLK and are stable after the specified time delay (T<sub>PD</sub>). Sequential read is possible when CS is held high. The memory data will automatically cycle to the next register and output sequentially.

**FIGURE 2-7: READ TIMING**



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

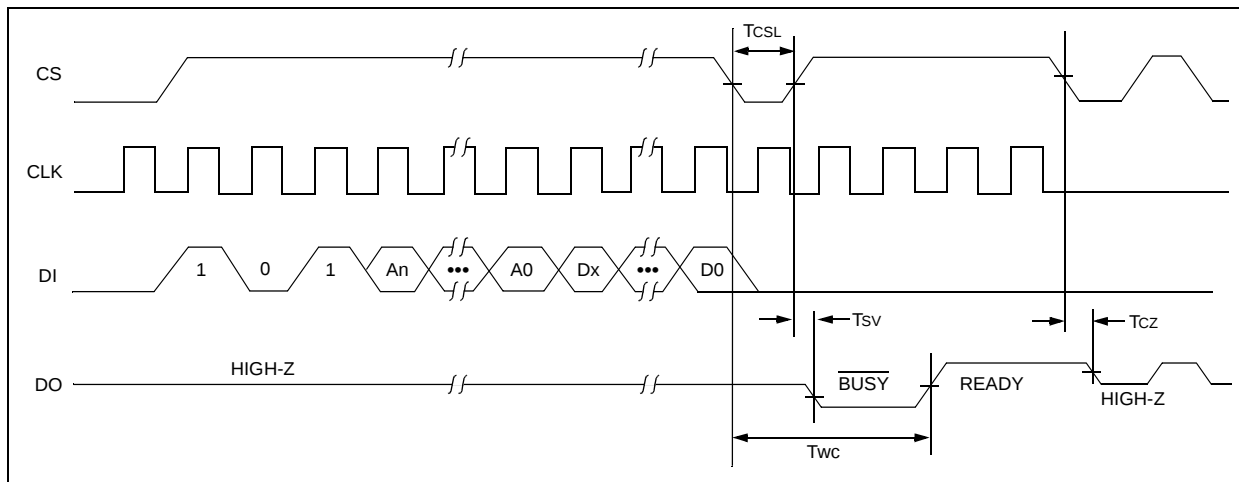
## 2.8 WRITE

The WRITE instruction is followed by 8 bits (If ORG is low or A-version devices) or 16 bits (If ORG pin is high or B-version devices) of data which are written into the specified address. For 93AA46A/B/C and 93LC46A/B/C devices, after the last data bit is clocked into DI, the falling edge of CS initiates the self-timed auto-erase and programming cycle. For 93C46A/B/C devices, the self-timed auto-erase and programming cycle is initiated by the rising edge of CLK on the last data bit.

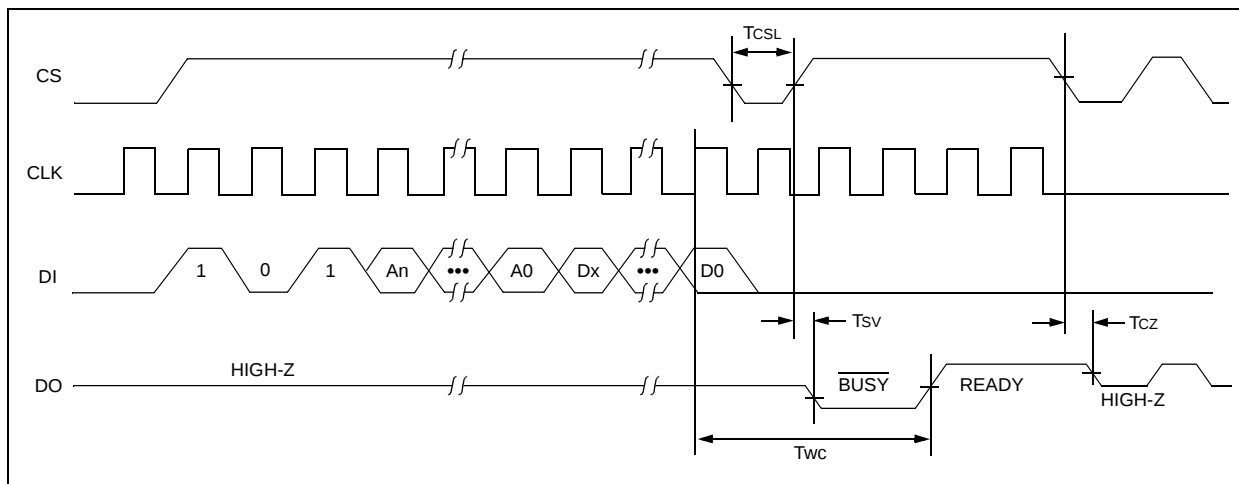
The DO pin indicates the READY/ $\overline{\text{BUSY}}$  status of the device, if CS is brought high after a minimum of 250 ns low ( $T_{\text{CSL}}$ ). DO at logical '0' indicates that programming is still in progress. DO at logical '1' indicates that the register at the specified address has been written with the data specified and the device is ready for another instruction.

**Note:** Issuing a Start bit and then taking CS low will clear the READY/ $\overline{\text{BUSY}}$  status from DO.

**FIGURE 2-8: WRITE TIMING FOR 93AA AND 93LC DEVICES**



**FIGURE 2-9: WRITE TIMING FOR 93C DEVICES**



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 2.9 WRITE ALL (WRAL)

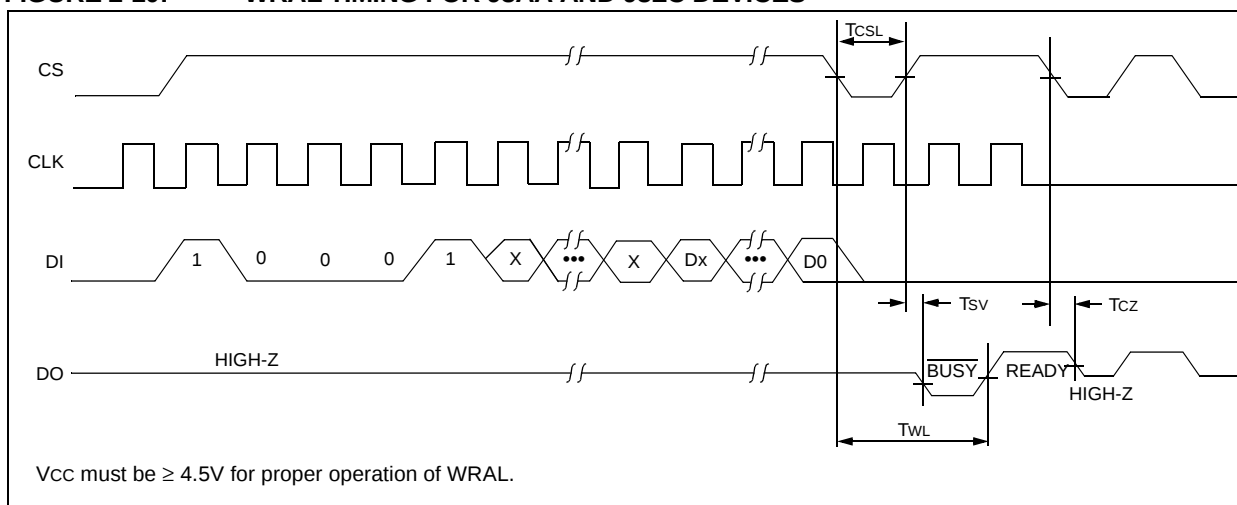
The Write All (WRAL) instruction will write the entire memory array with the data specified in the command. For 93AA46A/B/C and 93LC46A/B/C devices, after the last data bit is clocked into DI, the falling edge of CS initiates the self-timed auto-erase and programming cycle. For 93C46A/B/C devices, the self-timed auto-erase and programming cycle is initiated by the rising edge of CLK on the last data bit. Clocking of the CLK pin is not necessary after the device has entered the WRAL cycle. The WRAL command does include an automatic ERAL cycle for the device. Therefore, the WRAL instruction does not require an ERAL instruction but the chip must be in the EWEN status.

The DO pin indicates the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status of the device if CS is brought high after a minimum of 250 ns low (TCSL).

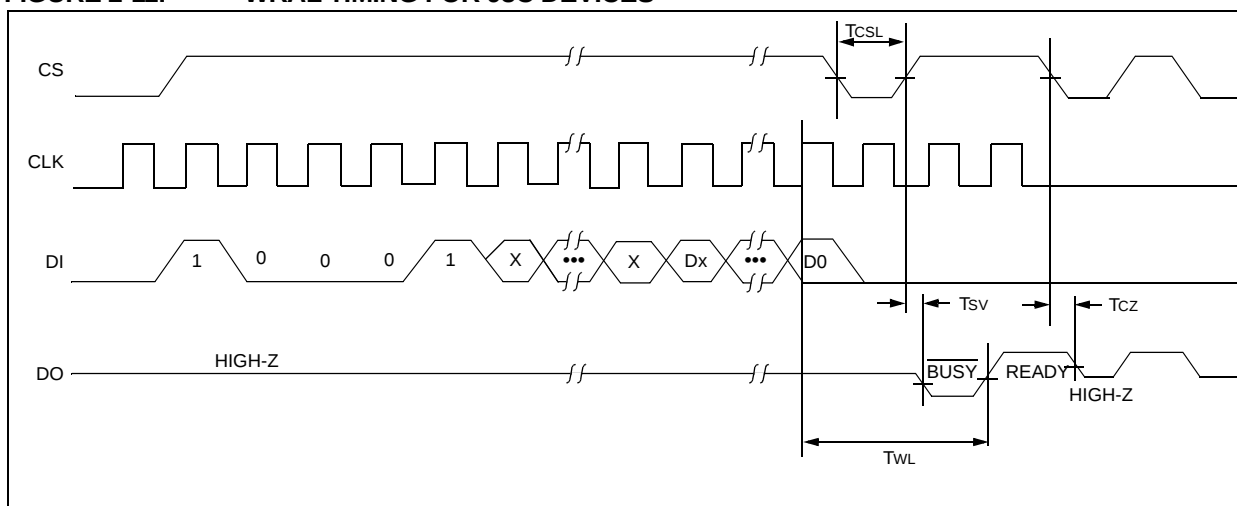
**Note:** Issuing a Start bit and then taking CS low will clear the  $\overline{\text{READY}}/\overline{\text{BUSY}}$  status from DO.

VCC must be  $\geq 4.5\text{V}$  for proper operation of WRAL.

**FIGURE 2-10: WRAL TIMING FOR 93AA AND 93LC DEVICES**



**FIGURE 2-11: WRAL TIMING FOR 93C DEVICES**



# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 3.0 PIN DESCRIPTIONS

TABLE 3-1: PIN DESCRIPTIONS

| Name   | SOIC/PDIP/<br>MSOP/<br>TSSOP | SOT-23 | Rotated SOIC | Function                                                     |
|--------|------------------------------|--------|--------------|--------------------------------------------------------------|
| CS     | 1                            | 5      | 3            | Chip Select                                                  |
| CLK    | 2                            | 4      | 4            | Serial Clock                                                 |
| DI     | 3                            | 3      | 5            | Data In                                                      |
| DO     | 4                            | 1      | 6            | Data Out                                                     |
| Vss    | 5                            | 2      | 7            | Ground                                                       |
| ORG/NC | 6                            | N/A    | 8            | Organization / 93XX46C<br>No internal connection / 93XX46A/B |
| NC     | 7                            | N/A    | 1            | No Internal Connection                                       |
| Vcc    | 8                            | 6      | 2            | Power Supply                                                 |

### 3.1 Chip Select (CS)

A high level selects the device; a low level deselects the device and forces it into Standby mode. However, a programming cycle which is already in progress will be completed, regardless of the Chip Select (CS) input signal. If CS is brought low during a program cycle, the device will go into Standby mode as soon as the programming cycle is completed.

CS must be low for 250 ns minimum (T<sub>CSL</sub>) between consecutive instructions. If CS is low, the internal control logic is held in a Reset status.

### 3.2 Serial Clock (CLK)

The Serial Clock is used to synchronize the communication between a master device and the 93XX series device. Opcodes, address and data bits are clocked in on the positive edge of CLK. Data bits are also clocked out on the positive edge of CLK.

CLK can be stopped anywhere in the transmission sequence (at high or low level) and can be continued anytime with respect to clock high time (T<sub>CKH</sub>) and clock low time (T<sub>CKL</sub>). This gives the controlling master freedom in preparing opcode, address and data.

CLK is a "Don't Care" if CS is low (device deselected). If CS is high, but the Start condition has not been detected (DI = 0), any number of clock cycles can be received by the device without changing its status (i.e., waiting for a Start condition).

CLK cycles are not required during the self-timed WRITE (i.e., auto ERASE/WRITE) cycle.

After detection of a Start condition the specified number of clock cycles (respectively low-to-high transitions of CLK) must be provided. These clock cycles are required to clock in all required opcode, address and

data bits before an instruction is executed. CLK and DI then become don't care inputs waiting for a new Start condition to be detected.

### 3.3 Data In (DI)

Data In (DI) is used to clock in a Start bit, opcode, address and data synchronously with the CLK input.

### 3.4 Data Out (DO)

Data Out (DO) is used in the READ mode to output data synchronously with the CLK input (T<sub>PD</sub> after the positive edge of CLK).

This pin also provides READY/BUSY status information during ERASE and WRITE cycles. READY/BUSY status information is available on the DO pin if CS is brought high after being low for minimum Chip Select low time (T<sub>CSL</sub>) and an ERASE or WRITE operation has been initiated.

The Status signal is not available on DO, if CS is held low during the entire ERASE or WRITE cycle. In this case, DO is in the HIGH-Z mode. If status is checked after the ERASE/WRITE cycle, the data line will be high to indicate the device is ready.

**Note:** Issuing a Start bit and then taking CS low will clear the READY/BUSY status from DO.

### 3.5 Organization (ORG)

When the ORG pin is connected to Vcc or Logic HI, the (x16) memory organization is selected. When the ORG pin is tied to Vss or Logic LO, the (x8) memory organization is selected. For proper operation, ORG must be tied to a valid logic level.

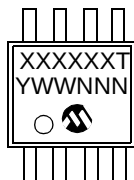
93XX46A devices are always x8 organization and 93XX46B devices are always x16 organization.

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 4.0 PACKAGING INFORMATION

### 4.1 Package Marking Information

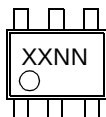
8-Lead MSOP (150 mil)



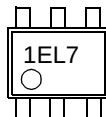
Example:



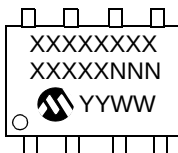
6-Lead SOT-23



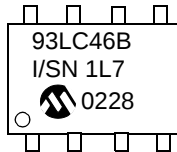
Example:



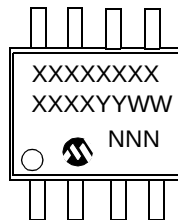
8-Lead PDIP



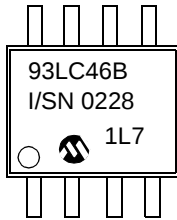
Example:



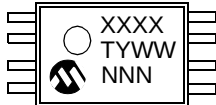
8-Lead SOIC



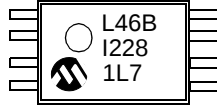
Example:



8-Lead TSSOP



Example:



MSOP 1st Line Marking Codes

| Device  | std mark | Pb-free mark |
|---------|----------|--------------|
| 93AA46A | 3A46AT   | GA46AT       |
| 93AA46B | 3A46BT   | GA46BT       |
| 93AA46C | 3A46CT   | GA46CT       |
| 93LC46A | 3L46AT   | GL46AT       |
| 93LC46B | 3L46BT   | GL46BT       |
| 93LC46C | 3L46CT   | GL46CT       |
| 93C46A  | 3C46AT   | GC46AT       |
| 93C46B  | 3C46BT   | GC46BT       |
| 93C46C  | 3C46CT   | GC46CT       |

T = blank for commercial, "I" for Industrial, "E" for Extended.

SOT23 Marking Codes

| Device  | I-temp | E-temp |
|---------|--------|--------|
| 93AA46A | 1BNN   | —      |
| 93AA46B | 1LNN   | —      |
| 93LC46A | 1ENN   | 1FNN   |
| 93LC46B | 1PNN   | 1RNN   |
| 93C46A  | 1HNN   | 1JNN   |
| 93C46B  | 1TNN   | 1UNN   |

Pb-free topside mark is same; Pb-free noted only on carton label.

TSSOP 1st Line Marking Codes

| Device  | std mark | Pb-free mark |
|---------|----------|--------------|
| 93AA46A | A46A     | GAAA         |
| 93AA46B | A46B     | GAAB         |
| 93AA46C | A46C     | GAAC         |
| 93LC46A | L46A     | GLAA         |
| 93LC46B | L46B     | GLAB         |
| 93LC46C | L46C     | GLAC         |
| 93C46A  | C46A     | GCAA         |
| 93C46B  | C46B     | GCAB         |
| 93C46C  | C46C     | GCAC         |

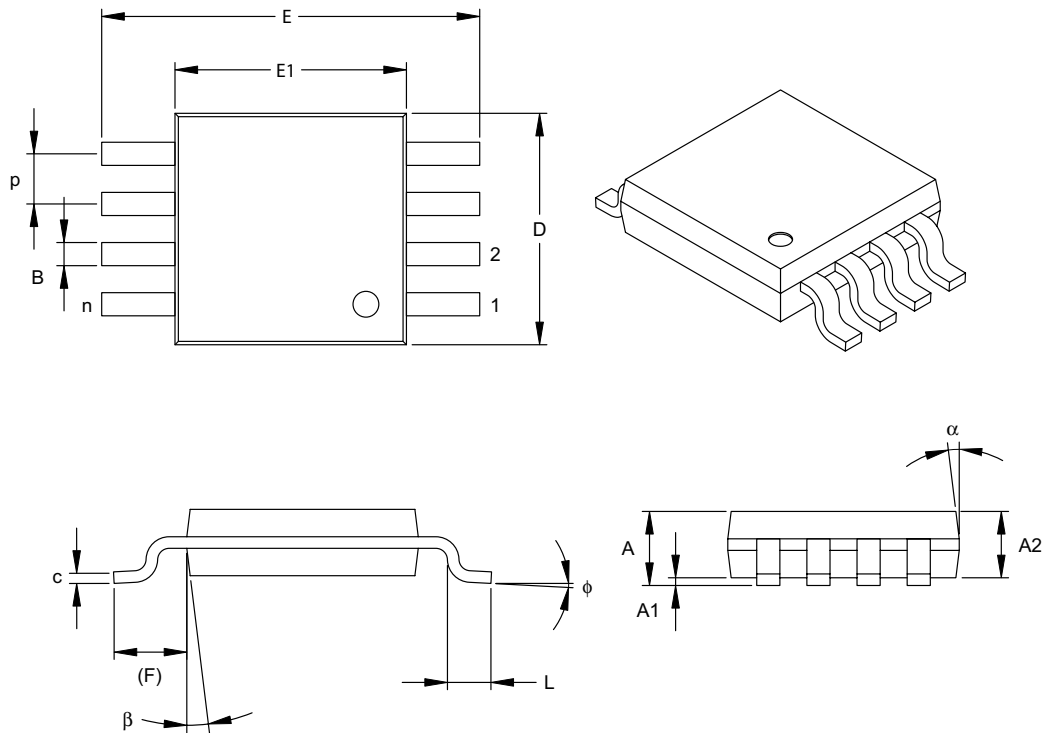
Temperature grade is marked on line 2.

|                |        |                                                                                                  |
|----------------|--------|--------------------------------------------------------------------------------------------------|
| <b>Legend:</b> | XX...X | Part number                                                                                      |
|                | T      | Temperature                                                                                      |
|                | Blank  | Commercial                                                                                       |
|                | I      | Industrial                                                                                       |
|                | E      | Extended                                                                                         |
|                | YY     | Year code (last 2 digits of calendar year) except TSSOP and MSOP which use only the last 1 digit |
|                | WW     | Week code (week of January 1 is week '01')                                                       |
|                | NNN    | Alphanumeric traceability code                                                                   |

**Note:** Custom marking available.

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 8-Lead Plastic Micro Small Outline Package (MS) (MSOP)



| Units                    |          | INCHES |           |      | MILLIMETERS* |          |      |
|--------------------------|----------|--------|-----------|------|--------------|----------|------|
| Dimension Limits         |          | MIN    | NOM       | MAX  | MIN          | NOM      | MAX  |
| Number of Pins           | n        |        | 8         |      |              | 8        |      |
| Pitch                    | p        |        | .026 BSC  |      |              | 0.65 BSC |      |
| Overall Height           | A        | -      | -         | .043 | -            | -        | 1.10 |
| Molded Package Thickness | A2       | .030   | .033      | .037 | 0.75         | 0.85     | 0.95 |
| Standoff                 | A1       | .000   | -         | .006 | 0.00         | -        | 0.15 |
| Overall Width            | E        |        | .193 TYP. |      |              | 4.90 BSC |      |
| Molded Package Width     | E1       |        | .118 BSC  |      |              | 3.00 BSC |      |
| Overall Length           | D        |        | .118 BSC  |      |              | 3.00 BSC |      |
| Foot Length              | L        | .016   | .024      | .031 | 0.40         | 0.60     | 0.80 |
| Footprint (Reference)    | F        |        | .037 REF  |      |              | 0.95 REF |      |
| Foot Angle               | $\phi$   | 0°     | -         | 8°   | 0°           | -        | 8°   |
| Lead Thickness           | c        | .003   | .006      | .009 | 0.08         | -        | 0.23 |
| Lead Width               | B        | .009   | .012      | .016 | 0.22         | -        | 0.40 |
| Mold Draft Angle Top     | $\alpha$ | 5°     | -         | 15°  | 5°           | -        | 15°  |
| Mold Draft Angle Bottom  | $\beta$  | 5°     | -         | 15°  | 5°           | -        | 15°  |

\*Controlling Parameter

### Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MO-187

Drawing No. C04-111

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 6-Lead Plastic Small Outline Transistor (OT) (SOT-23)



| Units                      |       | INCHES* |      |      | MILLIMETERS |      |      |
|----------------------------|-------|---------|------|------|-------------|------|------|
| Dimension Limits           |       | MIN     | NOM  | MAX  | MIN         | NOM  | MAX  |
| Number of Pins             | n     |         | 6    |      |             | 6    |      |
| Pitch                      | p     |         | .038 |      |             | 0.95 |      |
| Outside lead pitch (basic) | p1    |         | .075 |      |             | 1.90 |      |
| Overall Height             | A     | .035    | .046 | .057 | 0.90        | 1.18 | 1.45 |
| Molded Package Thickness   | A2    | .035    | .043 | .051 | 0.90        | 1.10 | 1.30 |
| Standoff                   | A1    | .000    | .003 | .006 | 0.00        | 0.08 | 0.15 |
| Overall Width              | E     | .102    | .110 | .118 | 2.60        | 2.80 | 3.00 |
| Molded Package Width       | E1    | .059    | .064 | .069 | 1.50        | 1.63 | 1.75 |
| Overall Length             | D     | .110    | .116 | .122 | 2.80        | 2.95 | 3.10 |
| Foot Length                | L     | .014    | .018 | .022 | 0.35        | 0.45 | 0.55 |
| Foot Angle                 | phi   | 0       | 5    | 10   | 0           | 5    | 10   |
| Lead Thickness             | c     | .004    | .006 | .008 | 0.09        | 0.15 | 0.20 |
| Lead Width                 | B     | .014    | .017 | .020 | 0.35        | 0.43 | 0.50 |
| Mold Draft Angle Top       | alpha | 0       | 5    | 10   | 0           | 5    | 10   |
| Mold Draft Angle Bottom    | beta  | 0       | 5    | 10   | 0           | 5    | 10   |

\*Controlling Parameter

Notes:

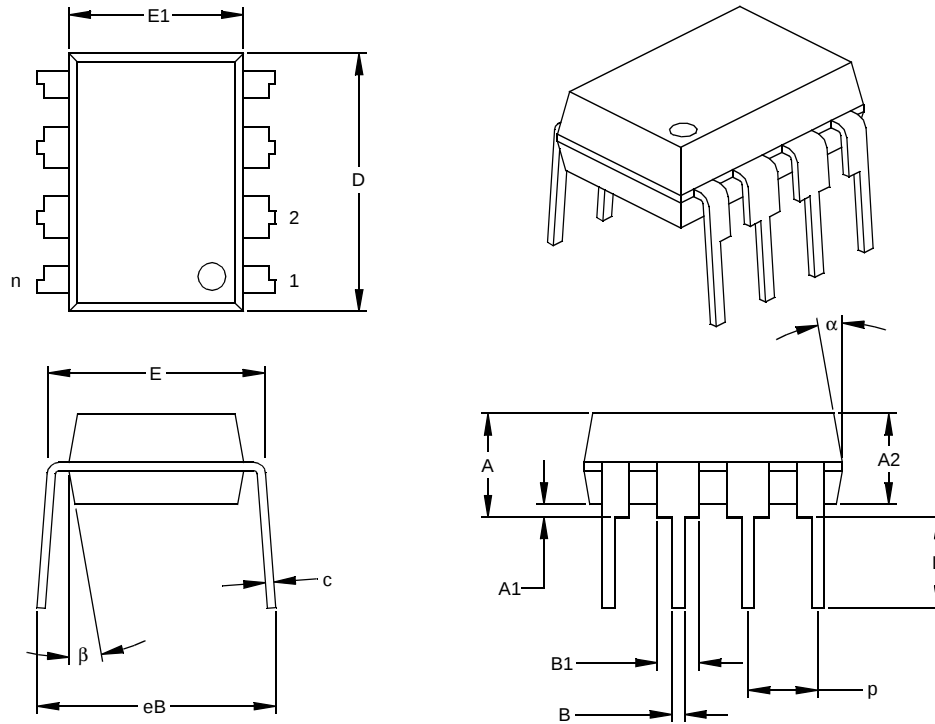
Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEITA (formerly EIAJ) equivalent: SC-74A

Drawing No. C04-120

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 8-Lead Plastic Dual In-line (P) – 300 mil (PDIP)



| Units                      |      | INCHES* |      |      | MILLIMETERS |      |       |
|----------------------------|------|---------|------|------|-------------|------|-------|
| Dimension Limits           |      | MIN     | NOM  | MAX  | MIN         | NOM  | MAX   |
| Number of Pins             | n    |         | 8    |      |             | 8    |       |
| Pitch                      | p    |         | .100 |      |             | 2.54 |       |
| Top to Seating Plane       | A    | .140    | .155 | .170 | 3.56        | 3.94 | 4.32  |
| Molded Package Thickness   | A2   | .115    | .130 | .145 | 2.92        | 3.30 | 3.68  |
| Base to Seating Plane      | A1   | .015    |      |      | 0.38        |      |       |
| Shoulder to Shoulder Width | E    | .300    | .313 | .325 | 7.62        | 7.94 | 8.26  |
| Molded Package Width       | E1   | .240    | .250 | .260 | 6.10        | 6.35 | 6.60  |
| Overall Length             | D    | .360    | .373 | .385 | 9.14        | 9.46 | 9.78  |
| Tip to Seating Plane       | L    | .125    | .130 | .135 | 3.18        | 3.30 | 3.43  |
| Lead Thickness             | c    | .008    | .012 | .015 | 0.20        | 0.29 | 0.38  |
| Upper Lead Width           | B1   | .045    | .058 | .070 | 1.14        | 1.46 | 1.78  |
| Lower Lead Width           | B    | .014    | .018 | .022 | 0.36        | 0.46 | 0.56  |
| Overall Row Spacing        | § eB | .310    | .370 | .430 | 7.87        | 9.40 | 10.92 |
| Mold Draft Angle Top       | α    | 5       | 10   | 15   | 5           | 10   | 15    |
| Mold Draft Angle Bottom    | β    | 5       | 10   | 15   | 5           | 10   | 15    |

\* Controlling Parameter

§ Significant Characteristic

### Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-001

Drawing No. C04-018

# 93A46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 8-Lead Plastic Small Outline (SN) – Narrow, 150 mil (SOIC)



| Units                    |    | INCHES* |      |      | MILLIMETERS |      |      |
|--------------------------|----|---------|------|------|-------------|------|------|
| Dimension Limits         |    | MIN     | NOM  | MAX  | MIN         | NOM  | MAX  |
| Number of Pins           | n  |         | 8    |      |             | 8    |      |
| Pitch                    | p  |         | .050 |      |             | 1.27 |      |
| Overall Height           | A  | .053    | .061 | .069 | 1.35        | 1.55 | 1.75 |
| Molded Package Thickness | A2 | .052    | .056 | .061 | 1.32        | 1.42 | 1.55 |
| Standoff §               | A1 | .004    | .007 | .010 | 0.10        | 0.18 | 0.25 |
| Overall Width            | E  | .228    | .237 | .244 | 5.79        | 6.02 | 6.20 |
| Molded Package Width     | E1 | .146    | .154 | .157 | 3.71        | 3.91 | 3.99 |
| Overall Length           | D  | .189    | .193 | .197 | 4.80        | 4.90 | 5.00 |
| Chamfer Distance         | h  | .010    | .015 | .020 | 0.25        | 0.38 | 0.51 |
| Foot Length              | L  | .019    | .025 | .030 | 0.48        | 0.62 | 0.76 |
| Foot Angle               | φ  | 0       | 4    | 8    | 0           | 4    | 8    |
| Lead Thickness           | c  | .008    | .009 | .010 | 0.20        | 0.23 | 0.25 |
| Lead Width               | B  | .013    | .017 | .020 | 0.33        | 0.42 | 0.51 |
| Mold Draft Angle Top     | α  | 0       | 12   | 15   | 0           | 12   | 15   |
| Mold Draft Angle Bottom  | β  | 0       | 12   | 15   | 0           | 12   | 15   |

\* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .010" (0.254mm) per side.

JEDEC Equivalent: MS-012

Drawing No. C04-057

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## 8-Lead Plastic Thin Shrink Small Outline (ST) – 4.4 mm (TSSOP)



| Units                    |    | INCHES |      |      | MILLIMETERS* |      |      |
|--------------------------|----|--------|------|------|--------------|------|------|
| Dimension Limits         |    | MIN    | NOM  | MAX  | MIN          | NOM  | MAX  |
| Number of Pins           | n  |        | 8    |      |              | 8    |      |
| Pitch                    | p  |        | .026 |      |              | 0.65 |      |
| Overall Height           | A  |        |      | .043 |              |      | 1.10 |
| Molded Package Thickness | A2 | .033   | .035 | .037 | 0.85         | 0.90 | 0.95 |
| Standoff §               | A1 | .002   | .004 | .006 | 0.05         | 0.10 | 0.15 |
| Overall Width            | E  | .246   | .251 | .256 | 6.25         | 6.38 | 6.50 |
| Molded Package Width     | E1 | .169   | .173 | .177 | 4.30         | 4.40 | 4.50 |
| Molded Package Length    | D  | .114   | .118 | .122 | 2.90         | 3.00 | 3.10 |
| Foot Length              | L  | .020   | .024 | .028 | 0.50         | 0.60 | 0.70 |
| Foot Angle               | φ  | 0      | 4    | 8    | 0            | 4    | 8    |
| Lead Thickness           | c  | .004   | .006 | .008 | 0.09         | 0.15 | 0.20 |
| Lead Width               | B  | .007   | .010 | .012 | 0.19         | 0.25 | 0.30 |
| Mold Draft Angle Top     | α  | 0      | 5    | 10   | 0            | 5    | 10   |
| Mold Draft Angle Bottom  | β  | 0      | 5    | 10   | 0            | 5    | 10   |

\* Controlling Parameter

§ Significant Characteristic

Notes:

Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .005" (0.127mm) per side.

JEDEC Equivalent: MO-153

Drawing No. C04-086

## APPENDIX A: REVISION HISTORY

### Revision D

Corrections to Section 1.0, Electrical Characteristics.  
Section 4.1, 6-Lead SOT-23 package to OT.

## ON-LINE SUPPORT

Microchip provides on-line support on the Microchip World Wide Web site.

The web site is used by Microchip as a means to make files and information easily available to customers. To view the site, the user must have access to the Internet and a web browser, such as Netscape® or Microsoft® Internet Explorer. Files are also available for FTP download from our FTP site.

### Connecting to the Microchip Internet Web Site

The Microchip web site is available at the following URL:

**[www.microchip.com](http://www.microchip.com)**

The file transfer site is available by using an FTP service to connect to:

**<ftp://ftp.microchip.com>**

The web site and file transfer site provide a variety of services. Users may download files for the latest Development Tools, Data Sheets, Application Notes, User's Guides, Articles and Sample Programs. A variety of Microchip specific business information is also available, including listings of Microchip sales offices, distributors and factory representatives. Other data available for consideration is:

- Latest Microchip Press Releases
- Technical Support Section with Frequently Asked Questions
- Design Tips
- Device Errata
- Job Postings
- Microchip Consultant Program Member Listing
- Links to other useful web sites related to Microchip Products
- Conferences for products, Development Systems, technical information and more
- Listing of seminars and events

## SYSTEMS INFORMATION AND UPGRADE HOT LINE

The Systems Information and Upgrade Line provides system users a listing of the latest versions of all of Microchip's development systems software products. Plus, this line provides information on how customers can receive the most current upgrade kits. The Hot Line Numbers are:

1-800-755-2345 for U.S. and most of Canada, and

1-480-792-7302 for the rest of the world.

042003

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

---

## READER RESPONSE

It is our intention to provide you with the best documentation possible to ensure successful use of your Microchip product. If you wish to provide your comments on organization, clarity, subject matter, and ways in which our documentation can better serve you, please FAX your comments to the Technical Publications Manager at (480) 792-4150.

Please list the following information, and use this outline to provide us with your comments about this document.

To: Technical Publications Manager  
RE: Reader Response  
Total Pages Sent \_\_\_\_\_  
From: Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City / State / ZIP / Country \_\_\_\_\_  
Telephone: (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_ FAX: (\_\_\_\_) \_\_\_\_\_ - \_\_\_\_\_

Application (optional):

Would you like a reply? \_\_\_Y \_\_\_N

Device: 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C Literature Number: DS21749D

Questions:

1. What are the best features of this document?

---

---

2. How does this document meet your hardware and software development needs?

---

---

3. Do you find the organization of this document easy to follow? If not, why?

---

---

4. What additions to the document do you think would enhance the structure and subject?

---

---

5. What deletions from the document could be made without affecting the overall usefulness?

---

---

6. Is there any incorrect or misleading information (what and where)?

---

---

7. How would you improve this document?

---

---

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u>   | <u>X</u> | <u>X</u>    | <u>X</u>                                   | <u>/XX</u> | <u>X</u>    |
|-------------------|----------|-------------|--------------------------------------------|------------|-------------|
| Device            | Pinout   | Tape & Reel | Temperature Range                          | Package    | Lead Finish |
| Device            |          |             |                                            |            |             |
| 93AA46A:          |          |             | 1K 1.8V Microwire Serial EEPROM            |            |             |
| 93AA46B:          |          |             | 1K 1.8V Microwire Serial EEPROM            |            |             |
| 93AA46C:          |          |             | 1K 1.8V Microwire Serial EEPROM w/ORG      |            |             |
| 93LC46A:          |          |             | 1K 2.5V Microwire Serial EEPROM            |            |             |
| 93LC46B:          |          |             | 1K 2.5V Microwire Serial EEPROM            |            |             |
| 93LC46C:          |          |             | 1K 2.5V Microwire Serial EEPROM w/ORG      |            |             |
| 93C46A:           |          |             | 1K 5.0V Microwire Serial EEPROM            |            |             |
| 93C46B:           |          |             | 1K 5.0V Microwire Serial EEPROM            |            |             |
| 93C46C:           |          |             | 1K 5.0V Microwire Serial EEPROM w/ORG      |            |             |
| Pinout:           | Blank =  |             | Standard pinout                            |            |             |
|                   | X =      |             | Rotated pinout                             |            |             |
| Tape & Reel:      | Blank =  |             | Standard packaging                         |            |             |
|                   | T =      |             | Tape & Reel                                |            |             |
| Temperature Range | I =      |             | -40°C to +85°C                             |            |             |
|                   | E =      |             | -40°C to +125°C                            |            |             |
| Package           | MS =     |             | Plastic MSOP (Micro Small outline, 8-lead) |            |             |
|                   | OT =     |             | SOT-23, 6-lead (Tape & Reel only)          |            |             |
|                   | P =      |             | Plastic DIP (300 mil body), 8-lead         |            |             |
|                   | SN =     |             | Plastic SOIC (150 mil body), 8-lead        |            |             |
|                   | ST =     |             | TSSOP, 8-lead                              |            |             |
| Lead Finish:      | Blank =  |             | Standard 63% / 37% SnPb                    |            |             |
|                   | G =      |             | Pure Matte Sn                              |            |             |

**Examples:**  
a) 93AA46C-I/MS: 1K, 128x8 or 64x16 Serial EEPROM, MSOP package, 1.8V  
b) 93AA46B-I/MS: 1K, 64x16 Serial EEPROM, MSOP package, 1.8V  
c) 93AA46AT-I/OT: 1K, 128x8 Serial EEPROM, SOT-23 package, tape and reel, 1.8V  
d) 93AA46CT-I/MS: 1K, 128x8 or 16x16 Serial EEPROM, MSOP package, tape and reel, 1.8V  
  
a) 93LC46A-I/MS: 1K, 128x8 Serial EEPROM, MSOP package, 2.5V  
b) 93LC46BT-I/OT: 1K, 64x16 Serial EEPROM, SOT-23 package, tape and reel, 2.5V  
c) 93LC46B-I/MS: 1K, 64x16 Serial EEPROM, MSOP package, 2.5V  
d) 93LC46BXT-I/SNG: 1K, 64x16 Serial EEPROM, SOIC package, rotated pinout, Industrial temperature, Pb-free finish, 2.5V  
  
a) 93C46B-I/MS: 1K, 64x16 Serial EEPROM, MSOP package, 5.0V  
b) 93C46C-I/MS: 1K, 128x8 or 16x16 Serial EEPROM, MSOP package, 5.0V  
c) 93C46AT-I/OT: 1K, 128x8 Serial EEPROM, SOT-23 package, tape and reel, 5.0V

## Sales and Support

### Data Sheets

Products supported by a preliminary Data Sheet may have an errata sheet describing minor operational differences and recommended workarounds. To determine if an errata sheet exists for a particular device, please contact one of the following:

1. Your local Microchip sales office
2. The Microchip Corporate Literature Center U.S. FAX: (480) 792-7277
3. The Microchip Worldwide Site ([www.microchip.com](http://www.microchip.com))

Please specify which device, revision of silicon and Data Sheet (include Literature #) you are using.

### New Customer Notification System

Register on our web site ([www.microchip.com/cn](http://www.microchip.com/cn)) to receive the most current information on our products.

# 93AA46A/B/C, 93LC46A/B/C, 93C46A/B/C

---

NOTES:

---

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

---

Information contained in this publication regarding device applications and the like is intended through suggestion only and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. No representation or warranty is given and no liability is assumed by Microchip Technology Incorporated with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Use of Microchip's products as critical components in life support systems is not authorized except with express written approval by Microchip. No licenses are conveyed, implicitly or otherwise, under any intellectual property rights.

**Trademarks**

The Microchip name and logo, the Microchip logo, Accuron, dsPIC, KEELoQ, MPLAB, PIC, PICmicro, PICSTART, PRO MATE and PowerSmart are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

Amplab, FilterLab, microID, MXDEV, MXLAB, PICMASTER, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Application Maestro, dsPICDEM, dsPICDEM.net, ECAN, ECONOMONITOR, FanSense, FlexROM, fuzzyLAB, In-Circuit Serial Programming, ICSP, ICEPIC, microPort, Migratable Memory, MPASM, MPLIB, MPLINK, MPSIM, PICKIT, PICDEM, PICDEM.net, PowerCal, PowerInfo, PowerMate, PowerTool, rLAB, rPIC, Select Mode, SmartSensor, SmartShunt, SmartTel and Total Endurance are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

Serialized Quick Turn Programming (SQTP) is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2003, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.



*Microchip received QS-9000 quality system certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona in July 1999 and Mountain View, California in March 2002. The Company's quality system processes and procedures are QS-9000 compliant for its PICmicro® 8-bit MCUs, KEELoQ® code hopping devices, Serial EEPROMs, microperipherals, non-volatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001 certified.*



## WORLDWIDE SALES AND SERVICE

### AMERICAS

#### Corporate Office

2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7200  
Fax: 480-792-7277  
Technical Support: 480-792-7627  
Web Address: <http://www.microchip.com>

#### Atlanta

3780 Mansell Road, Suite 130  
Alpharetta, GA 30022  
Tel: 770-640-0034  
Fax: 770-640-0307

#### Boston

2 Lan Drive, Suite 120  
Westford, MA 01886  
Tel: 978-692-3848  
Fax: 978-692-3821

#### Chicago

333 Pierce Road, Suite 180  
Itasca, IL 60143  
Tel: 630-285-0071  
Fax: 630-285-0075

#### Dallas

4570 Westgrove Drive, Suite 160  
Addison, TX 75001  
Tel: 972-818-7423  
Fax: 972-818-2924

#### Detroit

Tri-Atria Office Building  
32255 Northwestern Highway, Suite 190  
Farmington Hills, MI 48334  
Tel: 248-538-2250  
Fax: 248-538-2260

#### Kokomo

2767 S. Albright Road  
Kokomo, IN 46902  
Tel: 765-864-8360  
Fax: 765-864-8387

#### Los Angeles

18201 Von Karman, Suite 1090  
Irvine, CA 92612  
Tel: 949-263-1888  
Fax: 949-263-1338

#### Phoenix

2355 West Chandler Blvd.  
Chandler, AZ 85224-6199  
Tel: 480-792-7966  
Fax: 480-792-4338

#### San Jose

2107 North First Street, Suite 590  
San Jose, CA 95131  
Tel: 408-436-7950  
Fax: 408-436-7955

#### Toronto

6285 Northam Drive, Suite 108  
Mississauga, Ontario L4V 1X5, Canada  
Tel: 905-673-0699  
Fax: 905-673-6509

### ASIA/PACIFIC

#### Australia

Suite 22, 41 Rawson Street  
Epping 2121, NSW  
Australia  
Tel: 61-2-9868-6733  
Fax: 61-2-9868-6755

#### China - Beijing

Unit 915  
Bei Hai Wan Tai Bldg.  
No. 6 Chaoyangmen Beidajie  
Beijing, 100027, No. China  
Tel: 86-10-85282100  
Fax: 86-10-85282104

#### China - Chengdu

Rm. 2401-2402, 24th Floor,  
Ming Xing Financial Tower  
No. 88 TIDU Street  
Chengdu 610016, China  
Tel: 86-28-86766200  
Fax: 86-28-86766599

#### China - Fuzhou

Unit 28F, World Trade Plaza  
No. 71 Wusi Road  
Fuzhou 350001, China  
Tel: 86-591-7503506  
Fax: 86-591-7503521

#### China - Hong Kong SAR

Unit 901-6, Tower 2, Metroplaza  
223 Hing Fong Road  
Kwai Fong, N.T., Hong Kong  
Tel: 852-2401-1200  
Fax: 852-2401-3431

#### China - Shanghai

Room 701, Bldg. B  
Far East International Plaza  
No. 317 Xian Xia Road  
Shanghai, 200051  
Tel: 86-21-6275-5700  
Fax: 86-21-6275-5060

#### China - Shenzhen

Rm. 1812, 18/F, Building A, United Plaza  
No. 5022 Binhe Road, Futian District  
Shenzhen 518033, China  
Tel: 86-755-82901380  
Fax: 86-755-8295-1393

#### China - Shunde

Room 401, Hongjian Building  
No. 2 Fengxiangnan Road, Ronggui Town  
Shunde City, Guangdong 528303, China  
Tel: 86-765-8395507 Fax: 86-765-8395571

#### China - Qingdao

Rm. B505A, Fullhope Plaza,  
No. 12 Hong Kong Central Rd.  
Qingdao 266071, China  
Tel: 86-532-5027355 Fax: 86-532-5027205

#### India

Divyasree Chambers  
1 Floor, Wing A (A3/A4)  
No. 11, O'Shaughnessy Road  
Bangalore, 560 025, India  
Tel: 91-80-2290061 Fax: 91-80-2290062

#### Japan

Benex S-1 6F  
3-18-20, Shinyokohama  
Kohoku-Ku, Yokohama-shi  
Kanagawa, 222-0033, Japan  
Tel: 81-45-471- 6166 Fax: 81-45-471-6122

### Korea

168-1, Youngbo Bldg. 3 Floor  
Samsung-Dong, Kangnam-Ku  
Seoul, Korea 135-882  
Tel: 82-2-554-7200 Fax: 82-2-558-5932 or  
82-2-558-5934

### Singapore

200 Middle Road  
#07-02 Prime Centre  
Singapore, 188980  
Tel: 65-6334-8870 Fax: 65-6334-8850

### Taiwan

Kaohsiung Branch  
30F - 1 No. 8  
Min Chuan 2nd Road  
Kaohsiung 806, Taiwan  
Tel: 886-7-536-4818  
Fax: 886-7-536-4803

### Taiwan

Taiwan Branch  
11F-3, No. 207  
Tung Hua North Road  
Taipei, 105, Taiwan  
Tel: 886-2-2717-7175 Fax: 886-2-2545-0139

### EUROPE

#### Austria

Durisolstrasse 2  
A-4600 Wels  
Austria  
Tel: 43-7242-2244-399  
Fax: 43-7242-2244-393

#### Denmark

Regus Business Centre  
Lautrup høj 1-3  
Ballerup DK-2750 Denmark  
Tel: 45-4420-9895 Fax: 45-4420-9910

#### France

Parc d'Activite du Moulin de Massy  
43 Rue du Saule Trapu  
Batiment A - 1er Etage  
91300 Massy, France  
Tel: 33-1-69-53-63-20  
Fax: 33-1-69-30-90-79

#### Germany

Steinheilstrasse 10  
D-85737 Ismaning, Germany  
Tel: 49-89-627-144-0  
Fax: 49-89-627-144-44

#### Italy

Via Quasimodo, 12  
20025 Legnano (MI)  
Milan, Italy  
Tel: 39-0331-742611  
Fax: 39-0331-466781

#### Netherlands

P. A. De Biesbosch 14  
NL-5152 SC Drunen, Netherlands  
Tel: 31-416-690399  
Fax: 31-416-690340

#### United Kingdom

505 Eskdale Road  
Widdersh Triangle  
Wokingham  
Berkshire, England RG41 5TU  
Tel: 44-118-921-5869  
Fax: 44-118-921-5820

07/28/03